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R.L. CLARK WATER TREATMENT PLANT TORONTO

DRINKING WATER SURVEILLANCE PROGRAM

ANNUAL REPORT - 1986

MAY, 1987

Ontario
Ministry of the Environment

J. Bishop, Director
Water Resources Branch

R.L. CLARK WATER TREATMENT PLANT

TORONTO

DRINKING WATER SURVEILLANCE

PROGRAM

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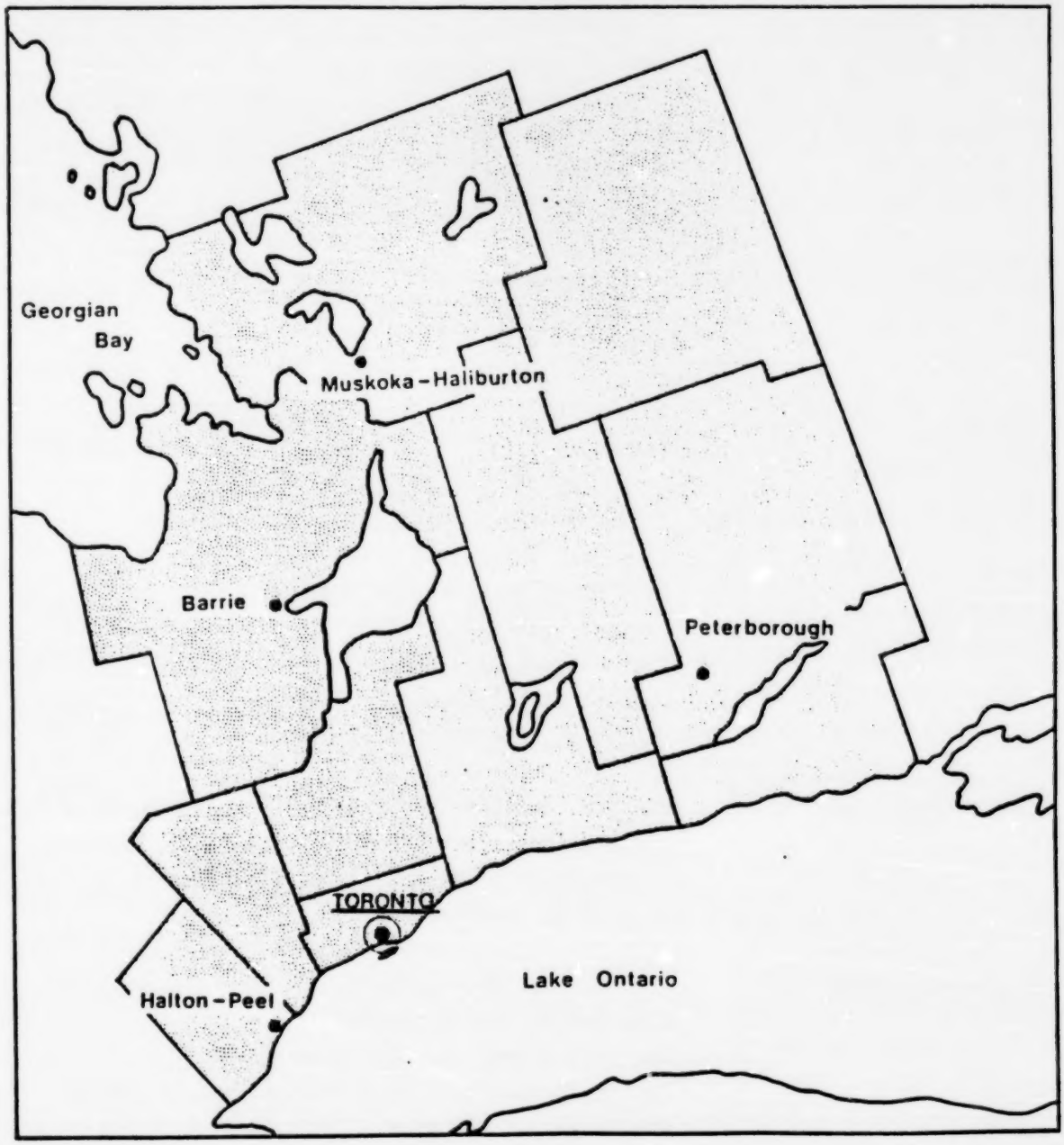
ONTARIO MINISTRY OF THE ENVIRONMENT

Central Region



R. L. CLARK WATER TREATMENT PLANT
TORONTO

Location:	45 23rd Street Toronto, Ontario M8V 3M6 (416-252-1611)
Source:	Lake Ontario
Design Capacity:	455 1000 M3/day
Operation:	Municipal
Plant Superintendent:	W. G. McEachern
Ministry Region:	Central Region Toronto Regional Office 7 Overlea Blvd. Toronto, Ontario M4H 1A8 (416-424-3000)
Municipalities Served:	City of Toronto (615,000) City of Etobicoke (298,490) City of North York (556,308) City of Scarborough (461,957) City of York (133,856) Borough of East York (97,679) Region of York (South) (170,000)
Treatment Type:	Physical and chemical treatment consisting of coagulation, flocculation, sedimentation and filtration (conventional) and disinfection as well as fluoridation.
Chemicals Used:	Prechlorination - chlorine Coagulation - alum liquid Dechlorination - sulphur dioxide Post chlorination - chlorination with chlorine and anhydrous ammonium Fluoridation - hydrofluosilicic acid

R.L. CLARK WATER TREATMENT PLANT
TORONTO

EXECUTIVE SUMMARY
DRINKING WATER SURVEILLANCE PROGRAM, 1986

The R.L. Clark Water Treatment Plant, Toronto was sampled 8 times in 1986; results are given for raw and treated samples.

The parameters analyzed fall into several categories: physical parameters and general chemistry, bacterial parameters, metals, and organic substances including volatile and chloroaromatic substances and pesticides.

The discussion of results focuses on health-related parameters found in treated water:

(a) **Organic Substances**

Analysis was carried out for approximately 110 organic compounds. The only volatile compounds found, trihalomethanes (THMs) were always present in treated waters; the highest level recorded for total THMs was 39 ug/L.

None of the pesticides analyzed for was found.

No chlorophenolic or chloroaromatic compounds were found.

(b) **Other Parameters**

The aesthetic ODWO* for organic nitrogen was exceeded in five treated water samples. Of the other physical, general chemistry and microbiological parameters and metals analyzed, for which there are health-related ODWO, none exceeded the objectives, in treated water.

The results of these analyses are consistent with those obtained in other areas of the Great Lakes.

The treated water from the supply did not exceed any known health-related guidelines for organic substances applicable to drinking water.

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* The Ontario Drinking Water Objectives, revised 1983.

R.L. CLARK WATER TREATMENT PLANT
TORONTO

SUMMARY TABLE OF RESULTS
DRINKING WATER SURVEILLANCE PROGRAM, 1986

The R.L. Clark Water Treatment Plant, Toronto was sampled 8 times in 1986.

PARAMETER CATEGORY	TYPE OF SAMPLE RAW	TREATED*
1. GENERAL CHEMISTRY - includes anions such as sulphate, field analyses such as chlorine residual and physical parameters such as colour.		
Total number of parameters in category: 21		
- Total number of analyses completed	144	133
- Total number of positive results	134	108
- Number of times guidelines exceeded	N/A	5
Guidelines exceeded - aesthetic ODWO** for organic nitrogen (5)		
2. METALS - includes metals such as copper and lead.		
Total number of parameters in category: 24		
- Total number of analyses completed	173	173
- Total number of positive results	93	86
- Number of times guidelines exceeded	N/A	0
3. BACTERIOLOGY - includes bacteria such as coliforms.		
Total number of parameters in category: 5		
- Total number of analyses completed	31	41
- Total number of positive results	29	11
- Number of times guidelines exceeded	N/A	0
4. VOLATILES - includes compounds such as benzene and toluene; also included in this category are trihalomethanes (5 parameters), acknowledged to be produced during water treatment.		
Total number of parameters in category: 29		
- Total number of analyses completed	226	226
- Total number of positive results	0	31
- Number of times guidelines exceeded	N/A	0
5. PESTICIDES -		
Total number of parameters possible in category: 65		
- Total number of analyses completed	299	299
- Total number of positive results	0	0
- Number of times guidelines exceeded	N/A	0
6. CHLOROAROMATICS AND CHLOROPHENOLS - includes a range of chlorinated organic compounds.		
Total number of parameters possible in category: 19		
- Total number of analyses completed	116	116
- Total number of positive results	0	0
- Number of times guidelines exceeded	N/A	0

* Total number of analyses completed will not always equal the number of parameters analyzed for multiplied by number of times the supply was sampled, because of accidents during shipping or analyses or analytical difficulties.

** Ontario Drinking Water Objective.

DRINKING WATER SURVEILLANCE PROGRAM

The Drinking Water Surveillance Program (DWSP) for Ontario is a computerized drinking water information system. The objectives of this program are to provide:

- immediate, reliable, current information on drinking water quality,
- a flagging mechanism for 'Objective' exceedence,
- a definition of contaminant levels and trends,
- a comprehensive background for remedial action,
- a framework for assessment of new contaminants,
- an indication of treatment efficiency of plant processes.

Program

The DWSP began in April 1986 and is designed to eventually include all municipal water supplies in Ontario. Water supply locations have been prioritized for surveillance, based primarily on such criteria as population density, probability of contamination and geographical location.

Once the data base becomes established, an assessment of monitoring requirements for the future will be made; monitoring will be continued at the initial locations at an appropriate level and further locations will be phased on to the program as resources permit. It is

estimated that after 4 years of operation, the program will be monitoring 90 locations.

A major goal of the program is to collect valid water quality data, in context with plant operation characteristics in the plant at the time of sampling.

Assessments are carried out at all locations prior to sampling in order to acquire full plant process and distribution system details, and to designate (and retrofit if necessary) all sampling systems and locations.

Samples are taken of the raw (ambient water quality) and treated water at the treatment plants, and also in the distribution systems. In order to determine possible effects of distribution on water quality, both standing and flowing water in old and new sections of the distribution system are sampled. Sampling is carried out by Ministry of the Environment (MOE) Regional staff and/or Municipal personnel who have been trained in the applicable procedures. Comprehensive sampling kits and documented sampling procedures are made available to samplers. This ensures that samples are taken and shipped according to standard protocols and that field testing will supply reliable data. All analyses are carried out using approved documented procedures.

Data Reporting Mechanism

Final analytical results are usually received by the DWSP reporting system within 6 weeks of the time of sampling. At this time, printouts of the completed analyses are sent to the MOE District Officer and the appropriate MOE regional office, and are also retained by the DWSP co-ordinator. The DWSP is able to monitor analysis results and assess trends. Should the level of

a contaminant exceed a health-related Ontario Drinking Water Objective, action is required as outlined in the publication, Ontario Drinking Water Objectives.* The DWSP issues an "Action Alert" which notifies appropriate MOE and health authorities, and supplies a history of the occurrence of the contaminant in the water supply system concerned.

Parameters Analyzed

About one hundred and forty (140) different parameters are routinely measured on DWSP covering microbiological, organic and inorganic substances of concern, as well as process parameters.

Parameters included in the program are based on the following criteria:

- probability that the substance has the potential to cause problems (health-related or aesthetic);
- probability of occurrence in ambient water;
- availability of routine analytical and sampling methods for monitoring and control purposes;
- feasibility of control.

The range of parameters includes those having Ontario Drinking Water Objectives (ODWO), World Health Organization Drinking Water Guideline values, or other

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* Ontario Drinking Water Objectives, revised 1983, published by the Ontario Ministry of the Environment.

jurisdiction's drinking water objectives (e.g. State of California) as well as compounds of concern to other agencies such as the International Joint Commission, and U.S. Environmental Protection Agency.

The parameters monitored routinely during 1986 are shown in Table 1; this table also includes available guidelines which are appropriate for drinking water, and the analytical detection limit (the lowest concentration that can be detected by laboratory analysis) for each parameter.

Analyses for additional pesticides may be included on certain sampling dates; such additional pesticides are selected from the list shown in Table 1A. These analyses may be done on a seasonal basis, in response to an identified concern or because of a potential for occurrence in certain locations. Seasonal analyses for specified additional pesticides are normally carried out at times corresponding to maximal agricultural use or run-off periods, i.e. in spring and fall seasons.

Drinking Water Guidelines

The Ministry of the Environment published a revised edition of "Ontario Drinking Water Objectives" in 1983.

The primary purpose of drinking water objectives is the protection of the health of the public consuming the water. Aesthetic considerations may also provide a basis for drinking water objectives, since the water should be pleasant to drink. The control of such aspects of water quality as hardness, corrosiveness, etc. is also important. The limits set are considered to outline the minimum requirements necessary to fulfill the above objectives, and may be either health-related or related to aesthetic and other considerations.

Because this survey covered such a large number of parameters, many of them did not have an ODWO. In order to be able to compare data results to health guidelines, it was necessary to refer to objectives and guidelines developed by other jurisdictions.

The footnotes to Table 1 indicate the sources and derivation of the various guidelines.

TABLE 1: DRINKING WATER SURVEILLANCE PROGRAM, PARAMETERS ANALYSED

PARAMETER CATEGORY	Objective Guideline (1)	Detection Limit	PARAMETER CATEGORY	Objective Guideline (1)	Detection Limit
CHEMISTRY:			Barium	1 mg/L	0.001 mg/L
Conductivity	-	0.01 UMHO/CM	Boron	5 mg/L	0.02 mg/L
			Beryllium	-	0.001 mg/L
Hardness	-	0.5 mg/L	Cyanide	0.2 mg/L	0.001 mg/L
Calcium	-	0.1 mg/L	Cadmium	0.005 mg/L	0.0003 mg/L
Magnesium	-	0.05 mg/L	Cobalt	-	0.001 mg/L
Sodium	-	0.1 mg/L	Chromium	0.05 mg/L	0.001 mg/L
Alkalinity		0.2 mg/L	Copper	1 mg/L	0.001 mg/L
pH	-	-	Mercury	1 µg/L	0.01 µg/L
Fluoride	2.4 mg/L	0.01 mg/L	Molybdenum	-	0.001 mg/L
Chloride	250 mg/L	0.2 mg/L	Nickel	-	0.002 mg/L
Residue total (solids)	-	1 mg/L	Lead	0.05 mg/L	0.003 mg/L
Turbidity	1 FTU	.01 FTU	Selenium	0.01 mg/L	0.001 mg/L
Phosphorus	-	0.002 mg/L	Strontium	-	0.001 mg/L
Phosphates	-	0.0005 mg/L	Vanadium	-	0.001 mg/L
Nitrogen Total Kjeldahl	0.15 mg/L*	0.1 mg/L	Zinc	5 mg/L	0.001 mg/L
Ammonium Total	-	0.05 mg/L			
Colour	5 TCU	0.5 TCU	BACTERIOLOGY (RAW ONLY):		
Nitrates Total	10 mg/L as N	.05 mg/L	Total Coliform MF	-	0
			Total Coliform MF BKGD	-	0
Nitrite	1 mg/L as N	0.0005 mg/L	Fecal Coliform	-	0
			Standard Plate Count MF	-	0
METALS:			(TREATED ONLY):		
Uranium	0.02 mg/L(t)	0.002 mg/L‡	Present/Absent (P/A) Test	Absent	Absent
Iron	0.3 mg/L	0.002 mg/L	Total Coliform MF BKGD	-	0
Manganese	0.05 mg/L	0.001 mg/L	Fecal Coliform	0	0
Aluminum	-	0.003 mg/L	Standard Plate Count MF	<500 orgs/mL	0
Arsenic	0.05 mg/L	0.001 mg/L			

TABLE 1: DRINKING WATER SURVEILLANCE PROGRAM, PARAMETERS ANALYSED (cont'd)

PARAMETER CATEGORY	Objective Guideline (1)	Detection Limit	PARAMETER CATEGORY	Objective Guideline (1)	Detection Limit
VOLATILES:			CHLOROAROMATICS:		
1,1-Dichloroethylene	0.3 µg/L(h)	1.0 µg/l	Hexachloroethane	19000 ng/L(e)	1 ng/L
Dichloromethane	40 µg/L(c)	5 µg/L	1,3,5-Trichlorobenzene	10000 ng/L(y)	5 ng/L
TRS-1,2-Dichloroethylene	-	1 µg/L	1,2,4-Trichlorobenzene	15000 ng/L(y)	5 ng/L
1,1-Dichloroethane	-	1 µg/L	Hexachlorobutadiene	4500 ng/L(e)	1 ng/L
Chloroform	350 µg/L++	1 µg/L	1,2,3-Trichlorobenzene	10000 ng/L(y)	5 ng/L
1,1,1-Trichloroethane	1000 µg/L(c)	1 µg/L	2,4,5-Trichlorotoluene	-	5 ng/L
1,2-Dichloroethane	10 µg/L(h)	1 µg/L	2,3,6-Trichlorotoluene	-	5 ng/L
Carbon Tetrachloride	3 µg/L(h)	1 µg/L	1,2,3,5-Tetrachloro-benzene	-	1 ng/L
Benzene	10 µg/L(h)	1 µg/L	1,2,4,5-Tetrachloro-benzene	38000 ng/L(e)	1 ng/L
1,2-Dichloropropane	-	1 µg/L	2,6,A-Trichlorotoluene	-	5 ng/L
Trichloroethylene	30 µg/L(h)	1 µg/L	1,2,3,4-Tetrachloro-benzene	-	1 ng/L
Dichlorobromomethane	350 µg/L++	1 µg/L	Pentachlorobenzene	74000 ng/L(e)	1 ng/L
Toluene	100 µg/L(c)	1 µg/L	Total PCB's	3000 ng/L(t)	20 ng/L
1,1,2-Trichloroethane	6 µg/L(e)	1 µg/L			
Chlorodibromomethane	350 µg/L++	1 µg/L	PESTICIDES:		
Tetrachloroethylene	10 µg/L(h)	1 µg/L	Hexachlorobenzene	10 ng/L(h)	1 ng/L
Chlorobenzene	100-300 ng/L(h)*	1 ng/L	Heptachlor	3000 ng/L+++	1 ng/L
Trifluorochlorotoluene	-	1 µg/L	Aldrin	700 ng/L**	1 ng/L
Ethylbenzene	1400 µg/L(e)	1 µg/L	PP-DDE	d	1 ng/L
Ethylene Dibromide	0.02 µg/L(x)	1 µg/L	Mirex	-	5 ng/L
P-Xylene	620 µg/L(c)	1 µg/L	Alpha BHC	700 ng/L(c)	1 ng/L
M-Xylene	620 µg/L(c)	1 µg/L	Beta BHC	300 ng/L(c)	1 ng/L
O-Xylene	620 µg/L(c)	1 µg/L	Gamma BHC (Lindane)	4000 ng/L	1 ng/L
Total Trihalomethanes	350 µg/L++	3 µg/L	Alpha Chlordane	7000 ng/L***	2 ng/L
Bromoform	350 µg/L++	1 µg/L	Gamma Chlordane	7000 ng/L***	2 ng/L
1,1,2,2-Tetrachloroethane	1.7 µg/L(e)	1 µg/L	Oxychlordane	-	2 ng/L
1,4-Dichlorobenzene	400 µg/L(e)	1 µg/L			
1,3-Dichlorobenzene	400 µg/L(e)	1 µg/L			
1,2-Dichlorobenzene	400 µg/L(e)	1 µg/L			

TABLE 1: DRINKING WATER SURVEILLANCE PROGRAM, PARAMETERS ANALYSED (cont'd)

PARAMETER CATEGORY	Objective Guideline (1)	Detection Limit	PARAMETER CATEGORY	Objective Guideline (1)	Detection Limit
Pesticides (cont'd)					
OP-DDT	30000 ng/L(d)	5 ng/L			
PP-DDD	d	5 ng/L			
PP-DDT	d	5 ng/L			
Methoxychlor	100000 ng/L	5 ng/L			
Heptachlor Epoxide	3000 ng/L+++	1 ng/L			
Endosulfan 1	74000 ng/L(ea)	2 ng/L			
Dieldrin	700 ng/L**	2 ng/L			
Endrin	200 ng/L	4 ng/L			
Endosulfan 2	74000 ng/L(ea)	4 ng/L			
Endosulfan Sulphate	-	4 ng/L			
Octachlorostyrene	-	1 ng/L			
Toxaphene	5000 ng/L	PA(xx)			

Footnotes:

(l) = Ontario Drinking Water Objectives (ODWO) for drinking water, unless noted.

(t) = ODWO Interim maximum acceptable concentration (IMAC) for drinking water.

(c) = California State Department of Health Action Level for drinking water.

(d) = ODWO for DDT (contains other isomers such as OPDDT and PPDDT).

(e) = US EPA ambient guideline; guideline levels when it is assumed that untreated water and fish and shellfish are consumed from the same body of water.

(ea) = United States Environmental Protection Agency (US EPA) ambient level for endosulfan (contains other isomers).

(h) = World Health Organization (WHO) guideline for drinking water.

(h)* = World Health Organization (WHO) Odour Threshold for drinking water.

(x) = State of Florida, maximum contaminant level for drinking water.

(xx) = the presence of toxaphene is detected in scan used; positive samples would be quantified by special additional analysis.

(y) = New York State (Taste and Odour) proposed drinking water guideline.

++ = total Trihalomethanes.

+++ = combined total; Heptachlor and Heptachlor Epoxide.

* = total Kjeldahl Nitrogen minus Ammonia Nitrogen.

** = total of Aldrin and Dieldrin.

*** = Chlordane is a mixture of alpha and gamma isomers.

‡ = Analysis changed to mass spectrometry method in mid-1986, detection limit 0.0001 mg/L.

TABLE 1A: DRINKING WATER SURVEILLANCE PROGRAM SPECIAL PESTICIDES

Dicamba	Reldan
2,4-D	Ronnel
2,4-DB	Carbofuran
2,4-DP	Propoxur
2,4,5-T	IPC
Silvex (2,4,5-TP)	Aminocarb
Picloram	CIPC
2,4,6-Trichlorophenol	Eptam
2,4,5-Trichlorophenol	Benonyl
2,3,4-Trichlorophenol	Bux
2,3,5,6-Tetrachlorophenol	Diallate
2,3,4,5-Tetrachlorophenol	Sevin
Pentachlorophenol	Sutan
Diazinon	Propazine
Dichlorvos	Atrazine
Dursban	Simazine
Ethion	Sencor (metribuzin)
Guthion	Bladex (Cyanazine)
Malathion	Prometone
Mevinphos	Ametryne
Methyl Parathion	Prometryne
Methyl Trithion	Atratone
Parathion	Alachlor
Phorate (Thimet)	Metolachlor

RESULTS AND DISCUSSION

The parameters analyzed fall into several categories: physical parameters and general chemistry (chemistry), bacterial parameters, metals, and organic substances including volatile and chloroaromatic substances and pesticides. Many of the substances analyzed for are naturally-occurring or treatment by-products.

The results of analysis of raw and treated water samples are shown in Tables 2 and 3. Table 2 shows the categories of parameters analyzed, as well as the total number of analyses which were completed in each category for both raw and treated water samples and the total number of positive results which were obtained. Table 3 lists the sampling dates and the numerical values for each parameter for which analysis produced a positive (quantifiable) result.

The R.L. Clark Water Treatment Plant, Toronto was sampled 8 times in 1986.

(a) Non Organic Substances

There are 242 positive results of 277 reported analyses for physical parameters, such as pH and temperature and general chemistry tests. The results of these tests are used as an indication of the analytical validity and integrity of the samples, the general characteristics of the water, and as a guide to making an assessment of the treatment process; they may also indicate whether any changes occur during the time elapsing between sampling and actual analysis. Organic nitrogen exceeded the aesthetic ODWO in 5 treated water samples; levels of organic nitrogen above the limit can result in taste and odour problems.

Positive bacteriological results were obtained for 40 analyses out of a total number reported of 72. These bacterial tests include those for species of paramount importance from a public health point of view, and those which assess the general bacteriological quality and characteristics of the water; by this means, a measure is obtained of the overall efficiency of water treatment processes. Positive results were obtained for treated water samples for standard plate count (a measure of the total number of bacteria in a water sample). The highest count was 22 organisms per mL. The ODWO recommend that treated water not exceed 500 organisms per mL for standard plate count. Low numbers of coliforms were detected by the Presence/Absence test on August 18 and again on September 15, 1986. The ODWO for 'poor water quality' states that "where total coliform bacteria are present at levels below 5 organisms per 100 mL, they should not occur in more than 25% of the samples in a single submission, nor in successive submissions from the same sample site". Although this occurred in successive DWSP submissions, regular, more frequent testing of the treated water at the treatment plant did not reveal any ODWO exceedences.

Analyses of 346 tests for metals in the water samples were reported; of these 179 were positive results. Metals can occur naturally and most are generally regarded as being ubiquitous. However, some may be present in water as a result of industrial or other discharges. A small number of metals have public health significance.

Of those parameters discussed above for which there are ODWO, none exceeded the Objectives except for

organic nitrogen. Nor did the levels exceed any guidelines for drinking water set by other jurisdictions, such as the U.S. Environmental Protection Agency (US EPA), the World Health Organization (WHO) and Health & Welfare, Canada (H&W, Canada). Furthermore, the results of these analyses are consistent with those obtained in other areas of the Great Lakes.

(b) Organic Substances

Of a total of 452 analyses for volatile organic compounds, only 31 were positive; these were from treated water samples and were all due to the presence of trihalomethanes.

Trihalomethanes (THMs) are acknowledged to be produced during the water treatment process and will almost always only occur in treated waters. Trihalomethanes are comprised mainly of chloroform, chlorodibromomethane and dichlorobromomethane with bromoform occurring occasionally. Results are reported for the individual compounds as well as for their sum, which is expressed as total trihalomethanes (Total THM). The ODWO for total THM is 350 ug/L; this level was not exceeded in any of the water samples included in this report, the highest level recorded being 39 ug/L on January 30, 1986.

Three hundred and eighty eight (388) tests were carried out for twenty three different pesticides; none was found above trace levels. Nine additional pesticides (propazine, atrazine, simazine, Sencor, Bladex, prometone, ametryne, prometryne and atratone) were analyzed for monthly as of June 16, 1986 in both raw and treated water. Metolachlor

and alachlor were added to this list as of July 27, 1986.

On August 18, 1986 and October 20, 1986, special pesticides (dicamba, 2,4-DP, 2,4-D, Silvex, 2,4,5-T, 2,4-DB and picloram) were analyzed; additional pesticides were tested for on October 20, 1986 (Table 1A). None of the above pesticides was found in raw or treated water. Special pesticides analysis is carried out only once or twice a year at each supply, on a seasonal basis, to correspond to the use and/or loss of such pesticides on agricultural land.

Six chlorophenolic compounds (2,4,6-trichlorophenol, 2,4,5-trichlorophenol, 2,3,4-trichlorophenol, 2,3,5,6-tetrachlorophenol, 2,3,4,5-tetrachlorophenol and pentachlorophenol) were analyzed for in conjunction with the special pesticides; none was found.

There were no positive chloroaromatic results out of a total of 208 analyses in this category.

CONCLUSIONS

The data reveal that for metals, inorganic ions, and bacterial parameters, raw water values are frequently in the detectable range; levels of metals and inorganics are also found in treated water. The levels of metals, inorganic compounds, and bacteria are consistent with those found in other water supplies in the province.

For the organic compounds, most are below detection levels, even though the most sophisticated equipment available was employed in the chemical analysis.

ODWO have not been established for some of the compounds analysed; for these few compounds, use was made of appropriate guidelines set by other agencies, such as the World Health Organization, the US Environmental Protection Agency, Health and Welfare Canada or other agencies. None of these guidelines was exceeded.

The treated water at the supply did not exceed any known health-related guidelines for organic substances applicable to drinking water.

TABLE 2

R.L. CLARK WATER TREATMENT PLANT
TORONTO

	PARAMETER GROUP	TYPE OF SAMPLE RAW	TREATED
1.	GENERAL CHEMISTRY		
	- Total samples	144	133
	- Total positives	134	108
2.	METALS		
	- Total samples	173	173
	- Total positives	93	86
3.	BACTERIOLOGY		
	- Total samples	31	41
	- Total positives	29	11
4.	VOLATILES		
	- Total samples	226	226
	- Total positives	0	31
5.	PESTICIDES		
	- Total samples	194	194
	- Total positives	0	0
6.	CHLOROAROMATICS		
	- Total samples	104	104
	- Total positives	0	0
7.	CHLOROPHENOLS		
	- Total samples	12	12
	- Total positives	0	0
8.	SPECIAL PESTICIDES		
	- Total samples	105	105
	- Total positives	0	0

Table 3

R. L. CLARK WATER TREATMENT PLANT DWSP RESULTS

02/17/87

PARAMETERS	UNITS		SAMPLE DATE 86/01/30	86/06/16	86/07/21	86/08/18	86/09/15	86/10/20	86/11/17	86/12/15				
ALKALINITY	MG/L-CAC	R	96.000	99.70	98.500	96.900	101.80	103.90	101.30	101.10				
		T	86.200	89.000		88.000	95.000	94.800	93.800	92.100				
ALUMINUM	MG/L-AL	R	.072	.019	.033	.023	.037	.064	.034	.052				
		T	.170	.190	.240	.120	.077	.085	.072	.062				
ARSENIC	MG/L-AS	R	.001		.002				.002					
		T	.001		.002			.001	.001					
BARIUM	MG/L-BA	R	.018	.021	.021	.018	.020	.023	.021	.020				
		T	.017	.021	.021	.020	.022	.021	.021	.020				
BORON	MG/L-BO	R		.040	.030	.020	.030	.030	.030	.030				
		T		.030	.030	.030	.030	.030	.040	.040				
CALCIUM	MG/L-CA	R	39.000	42.800	40.200	39.200	40.600	40.400	40.200	39.300				
		T	39.000	41.900		39.400	40.900	41.000	40.900	39.500				
CHLORIDE	MG/L-CL	R	27.000	24.500	25.500	24.000	24.500	26.000	25.500	25.500				
		T	29.400	27.500	28.000	27.000	27.000	29.500	27.500	28.000				
COLOUR	HZU	R	3.000	2.000	3.000	2.500								
		T												
CONDUCTIVITY	UMHO/CM	R	335.00	324.00	327.00	314.00	317.00	345.00	327.00	336.00				
		T	340.00	330.00		321.00	324.00	349.00	331.00	340.00				
CHROMIUM	MG/L-CR	R	.002	.001		.001	.001	.001	.001	.001				
		T	.002				.001							
COPPER	MG/L-CU	R	.013	.010	.011	.011	.013	.015	.012	.260				
		T	.006	.002	.002	.002	.003	.011	.003	.007				

Table 3 (cont'd)

R. L. CLARK WATER TREATMENT PLANT DWSP RESULTS

02/17/87

PARAMETERS	UNITS		SAMPLE DATE 86/01/30	86/06/16	86/07/21	86/08/18	86/09/15	86/10/20	86/11/17	86/12/15				
FECAL COLIFORM MEMBRANE FILTRATION	CT/100ML	R	50.000	3.000	33.000		49.000		13.000					
		T												
IRON	MG/L-FE	R	.057	.024	.024	.009	.063	.097	.046	.055				
		T	.010	.004	.002		.006	.004	.007	.006				
FLUORIDE	MG/L-F	R	.150	.160	.150	.140	.120	.150	.150	.140				
		T	.880	1.060	1.150	1.150	1.100	1.170	1.100	1.110				
FIELD COMBINED CHLORINE RESIDUAL	MG/L-CL	R												
		T		.300	.530	.630	.650	.700	.700	.620				
FIELD FREE CHLORINE RESIDUAL	MG/L-CL	R												
		T		.380	.130	.080	.100	.100	.100	.100				
FIELD TOTAL CHLORINE RESIDUAL	MG/L-CL	R												
		T	.800	.680	.660	.710	.750	.800	.800	.720				
FIELD PH		R	8.200	8.400	8.500	8.200	8.000	8.100	8.200	8.100				
		T	7.600	7.400	7.500	7.540	7.600	7.500	7.600	7.300				
FIELD TEMPERATURE	DEG.C	R	3.500	9.500	15.500	12.500	7.500	7.500	7.000	4.500				
		T	3.500	10.000	14.500	13.000	9.000	8.500	7.500	4.500				
FIELD TURBIDITY	FTU	R	1.100	.700		1.200	1.500	2.500	1.500	1.500				
		T	.550	.220	.240	.220	.170	.210	.140	.220				
HARDNESS	MG/L-CAC	R	132.00	143.50	135.50	131.50	136.00	135.50	136.50	131.50				
		T	132.00	140.00		132.00	136.50	136.50	138.50	133.00				
STANDARD PLATE COUNT MEMBRANE FILT.	CT/ML	R		480.00		270.00		6.000	330.00	35.000				
		T		1.000	1.000	22.000	1.000		2.000	1.000				
MERCURY	UG/L-HG	R					.010	.010	.010	.020				
		T			.020	.010		.010	.020	.010				

Table 3 (cont'd)

R. L. CLARK WATER TREATMENT PLANT DWSP RESULTS

02/17/87

PARAMETERS	UNITS		SAMPLE DATE 86/01/30	86/06/16	86/07/21	86/08/18	86/09/15	86/10/20	86/11/17	86/12/15				
MAGNESIUM	MG/L-MG	R	8.500	8.850	8.450	8.300	8.400	8.400	8.850	8.150				
		T	8.400	8.550		8.100	8.400	8.300	8.800	8.350				
MANGANESE	MG/L-MN	R	.004	.002	.003	.002	.002	.006	.003	.003				
		T	.002	.001				.001	.001	.001				
MOLYBDENUM	MG/L-MB	R	.001	.001	.001	.001	.001	.001	.001	.001				
		T			.001	.001	.001	.001	.001	.001				
SODIUM	MG/L-NA	R	13.500	13.200	13.400	12.100	12.500	13.900	13.000	13.000				
		T	13.000	13.300		12.600	12.800	14.000	13.100	12.600				
NICKEL	MG/L-NI	R	.002		.002		.004	002						
		T	.001	.003			.003							
AMMONIUM TOTAL	MG/L-N	R	.030	.050	.050	.014	.014	.088	.034	.012				
		T	.048	.012	.106	.036	.076	.110	.058	.012				
NITRITE	MG/L-N	R	.008	.007	.016		.005	.041	.020	.012				
		T	.004		.005		.004	.002	.010	.005				
TOTAL NITRATES	MG/L-N	R	.425	.310	.305	.385	.445	.455	.425	.425				
		T	.430	.320	.280	.340	.490	.425	.410	.440				
NITROGEN TOTAL KJELDAHL	MG/L-N	R	.230	.340	.310	.200	.180	.280	.240	.140				
		T	.200	.190		.200	.210	.280	.220					
LEAD	MG/L-PB	R												
		T						.005						
PH		R	8.120	8.330	8.290	8.320	8.370	8.310	8.180	8.300				
		T	7.350	7.990		8.110	8.270	8.180	7.910	8.170				

Table 3 (cont'd)

R. L. CLARK WATER TREATMENT PLANT OWSP RESULTS

02/17/87

PARAMETERS	UNITS		SAMPLE DATE 86/01/30	86/06/16	86/07/21	86/08/18	86/09/15	86/10/20	86/11/17	86/12/15				
PHOSPHORUS FIL REACT	MG/L-P	R	.009			.005		.011	.004	.007				
		T	.007					.005		.003				
PHOSPHORUS TOTAL	MG/L-P	R	.021	.013	.011	.006	.009	.018	.014	.015				
		T	.011	.007				.006						
TOTAL SOLIDS	MG/L	R	218.00 CRO	211.00 CRO	213.00 CRO	204.00 CRO	208.00 CRO	222.00	213.00 CRO	218.00 CRO				
		T	221.06 CRO	215.00 CRO		209.00 CRO	217.00 CRO	227.00 CRO	215.00 CRO	221.00 CRO				
STRONTIUM	MG/L-SR	R	.160	.160	.170	.150	.160	.180	.170	.160				
		T	.160	.160	.180	.160	.170	.170	.170	.160				
COLIFORM	0=ABSENT	R												
		T				1.000	1.000							
TOTAL COLIFORM MEMBRANE FILTRATION	CT/100ML	R	1000.0	42.000	900.00	181.00 A3C	136.00 A3C	2900.0	111.00 A3C	14.000				
		T												
TOTAL COLIFORM BACKGROUND MF	CT/100ML	R	1900.0	246.00	0900.0		3400.0	3900.0	730.00	50.000				
		T						1.000						
TURBIDITY	FTU	R	2.400	2.100			2.400	3.900	2.300	3.100				
		T							.150	.340				
URANIUM	UG/L-U	R			.566	.350	.360	.350	.410	.320				
		T			.410	.360	.360	.360	.380	.380				
VANADIUM	MG/L-V	R												
		T					.001							
CHLOROFORM	UG/L	R												
		T	12.000	18.000	11.000	11.000	11.000	9.000	8.000	7.000				
DICHLOROBROMOMETHANE	UG/L	R												
		T	12.000	12.000	8.000	9.000	9.000	6.000	9.000	7.000				

Table 3 (cont'd)

R. L. CLARK WATER TREATMENT PLANT DWSP RESULTS

02/17/87

PARAMETERS	UNITS		SAMPLE DATE											
			86/01/30	86/06/16	86/07/21	86/08/18	86/09/15	86/10/20	86/11/17	86/12/15				
CHLORODIBROMOMETHANE	UG/L	R												
		T	15.000	7.000	5.000	5.000	3.000	1.000		5.000				
TOTAL TRIHALOMETHANES	UG/L	R												
		T	39.000	37.000	24.000	25.000	23.000	16.000	16.000	19.000				
ZINC	MG/L-ZN	R	.005	.001	.001		.006	.004	.003					
		T	.007	.001		.004	.008	.004	.003	.003				